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ABSTRACT

The observational study examined the sign language and communication abilities of 10 nonspeaking, autistic and autisticlike children (6 to 14 years old) involved in simultaneous communication training. Video data were collected as each child interacted with his/her therapist and with an unfamiliar adult. Analyses of the children's and adults' language use were based upon M. Halliday's sociolinguistic model and upon case grammar theory. A large proportion of child utterances were imitative or ritualistic in nature. Variability between children was apparent in terms of linguistic spontaneity and overall productivity, though each child demonstrated the ability to employ signs in the service of social interactional goals. Nine of the ten children used signs in a combinatorial fashion in order to express case (or semantic) relations. Findings have implications for the design of language training procedures for autistic and other linguistically handicapped children. (Author/SB)

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Sign Language Use by Autistic Children: A Pragmatic Analysis*

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* Paper presented at the American Psychological Association Convention, Montreal, 1980.

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Sign Language Use by Autistic Children: A Pragmatic Analysis

J. Oxman & Joanna Blake
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The present, observational study set out to explore the language and communication abilities of ten, autistic and autistic-like children who, despite previous speech training, evidenced no or minimal speech production skills. At the time of the study, the children were enrolled in various simultaneous communication(SC) programs -- where therapists use both sign language and speech together, but with emphasis on the manual component and on the child's mastery of signing skills. To varying degrees, all of the children in the study had learned to use and understand sign language.

The study was exploratory in nature, aimed at investigating the linguistic structure and the communicative functions of the children's signing. The methodology and analyses employed were based upon pragmatic(cf. Bates, 1976) and socio-linguistic (cf. Halliday, 1975) models of language development and functioning. This type of perspective was considered especially appropriate for the population of concern, in that it is focussed upon the communicative value of language use within a social context.

The poor and peculiar development of linguistic and social skills encompasses two of the four criterial diagnostic features of autism(Rutter, 1978). (The other two criterial features of the disorder concern the presence of stereotypies and the early

onset of the disorder.) Of these, and other, autistic symptoms (cf. Creak, 1964; Rutter, 1974; Wing, 1966), an impairment in the ability to establish emotional relationships has traditionally been considered to be the primary hallmark of the disorder. Within the past ten years, however, the linguistic difficulties of the autistic child have been the subject of a good deal of clinical, experimental and theoretical work in the area. The nature and severity of the linguistic defecits associated with autism have been found to be distinct to the syndrome, and in fact have been proposed as necessary (though likely not sufficient) conditions for the development of the disorder(Bartak, Rutter & Cox, 1975).

Longitudinal and follow-up studies(cf. Eisenberg, 1956; Wing, 1966) have indicated that the developmental prognosis for the non-speaking autistic child is quite poor, relative to that for speaking autistic children. Generally, non-speaking autistic children have been found to represent the more severely affected end of the autistic "continuum"(cf. Webster, Konstantareas, Oxman & Mack, 1980), cognitively as well as socially and emotionally(e.g., DeMyer, 1976). It remains, however, that the non-speaking sub-group of autistic children is not a strictly homogeneous population. Most certainly, such children do not respond uniformly to SC training(Bonvillian & Nelson, 1978). Considerable variability between children has been observed in the development of signing skills, in terms of: the rate and breadth of vocabulary growth; the degree to which spontaneous and pragmatic(i.e., functional or socially oriented) sign production occurs; and the use of signs in a

combinatorial(i.e., grammatical or rule-bound) fashion. Variability in these respects would seem to depend upon such factors as the child's levels of intellectual and social functioning, the intensity and duration of SC training, and the consistency of the child's home and school SC-language environments.

The aims of the present study were to: elucidate the socio-linguistic abilities of a heterogeneous sample of non-speaking autistic children involved in SC training; to investigate the relationships of such abilities to indices of cognitive and social development; and to thereby evaluate the present and potential efficacy of SC training procedures with the present and similar groups of children. The present report is concerned primarily with the first of these three main objectives.[1]

METHOD

Subjects

Nine boys and 1 girl -- ranging in age from 6 yrs., 7 mos. to 14 yrs., 10 mos.(mean age, 11 yrs., 9 mos.) -- participated in the study. Seven of the children had been diagnosed as autistic and 3(John, Bob and Carl) as mentally retarded with pronounced autistic features. Psychometric testing indicated that, conceptually and linguistically, the children were all functioning well below appropriate age-level norms. The level of language development demonstrated by each child was below that expected on

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[1] The present paper is based upon data from a dissertation project by J.O.

the basis of his/her conceptual ability.

Procedure

Following psychometric testing, each child participated in 4, 30-min. play sessions -- 2 with his/her familiar therapist, and 2 with an unfamiliar adult(J.O.) conversant in sign language. Each session followed a loosely structured format, involving the introduction of various toys and foods, looking at books and certain task-oriented activities. All sessions were video-taped for subsequent analyses.

Video Transcription and Coding

Transcriptions were made of each video session, whereby each of the children's utterances[1] was recorded. Each child-utterance was classified, by 2 independent coders, as to its communicative intent -- as to which of 9 Socio-linguistic categories it primarily represented. These categories are defined in Table 1.

Insert Table 1 about here

Each imitative utterance was noted. An "imitation" was defined as a partial or complete duplication of an adult-utterance, occurring not more than 30 secs. after the adult model and with not more than 3 child-utterances intervening. Imitative utterances were classified, by 2 independent coders, according to which of 3 types of adult-models they followed. Definitions of these Imitative Types(Interactive, Assimilative and Prompted) are provided in Table 2.

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[1] An utterance consisted of a word, a sign or the production of both word-and-sign together. Adult-utterances were also recorded, but shall not be dealt with in the present paper.

Insert Table 2 about here.

Non-imitative utterances were classified as "Spontaneous"(i.e., not prompted by the adult's question, instruction, etc.) or "Responsive"(i.e., in answer, or response, to the adult's question, command, etc.).[1]

The context in which each child-utterance was produced was also classified, by 2 independent coders. Context was defined primarily with regard to the child's activity, and was divided into the following categories: (1) Solitary Play; (2) Mutual Play(with the adult); (3) Onlooking behavior; (4) Negativistic and self-stimulatory behavior; (5) Physical Interaction with the adult(e.g., pat-a-cake); (6) Conversation(without toy play); (7) Looking at Books; and (8) "Mildly Frustrating Episode"(introduced by the adult and involving the child's obtaining of candies from difficult-to-open containers).

The non-imitative, multi-sign utterances produced by each child were recorded, for their later inspection via a case grammar approach.

RESULTS

Reliabilities

The mean percent agreement between the coders' classifications of the Socio-linguistic, Imitation and Contextual categories was 90.46%, 84.29% and 82.04%, respectively.

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[1] Imitation type was coded for session II only; the "Spontaneous", Responsive" and general "Imitative" character of child-utterances was noted for both sessions I and II.

Productivity

Table 3 lists, for each child, the number and mean length (MLU) of non-imitative utterances produced over the course of the 4 play sessions, and of those imitative utterances produced in session I.

Insert Table 3 about here.

It is apparent that the children varied widely in terms of the production of both imitative and non-imitative utterances. Overall MLU varied from 1.06 to 1.80 between children, with a mean of 1.31 for the sample. Though the mean MLU of non-imitative utterances was greater than that of the imitative utterances, the majority of child-utterances consisted of only 1 sign each.

The frequencies with which the various Utterance Types (Imitative, Responsive and Spontaneous) were produced by the children in session I were analyzed according to a 2(Adult) x 8(Context) x 3(Utterance Type) analysis of variance design. Results indicated that the children produced more utterances in the Familiar than the Unfamiliar Adult condition($F=5.31, 1/9, p < .05$). A significant Context x Utterance Type interaction($F=4.83, 14/126. p < .0001$), inspected by means of Neuman Keuls multiple comparisons ($\alpha = .05$), indicated that each Utterance Type occurred most often in Contextual category 2(Mutual Play), though Imitative utterances were produced most often, followed by Responsive and finally by Spontaneous utterances. Child-utterances were produced next most

frequently in Contextual categories 7(Looking at Books) and 6 (Conversation), again with Imitative utterances occurring most often, followed by Responsive and then Spontaneous utterances. The 3 Utterance Types were produced with equal frequency in the remaining Contextual categories. These results are depicted in Figure 1.

Insert Figure 1 about here

Analysis of variance results also indicated that the MLU of Responsive utterances(1.293) was greater than that of Imitative utterances(1.17), though neither differed significantly from the MLU of Spontaneous utterances(1.257)($F=5.11, d/18, p < .02$). The overall MLU's of the children's utterances did not differ between the 2 Adult conditions.

Imitation Types

The mean numbers of Interactive, Assimilative and Prompted imitations produced by the children in session II are shown in Figure 2.

Insert Figure 2 about here

A Freidman two-way analysis of variance indicated that Prompted imitation occurred least frequently($x_r^2=15.2, df=2, p < .001$). For 6 children, Assimilative imitation was more frequent than Interactive; for 3 children these 2 categories were coded with approximately equal frequency; and for 1 child(Louis), Interactive imitation occurred most often.

Socio-linguistic Performance

Classification of the children's and adults' utterances according to the Socio-linguistic categories yielded the average profiles depicted in Figure 3.

Insert Figure 3 about here.

It is of interest to note that the adult-utterances were most frequently associated with category 6(Heuristic), which is indicative of their frequent questioning of(and intrusiveness upon) the children.

The non-imitative child-utterance data represented in Figure 3 were analyzed according to a 2(Adult) x 2(Session) x 8(Context) x 5(Socio-linguistic Function)[1]factorial design. Non-imitative utterances, like imitative utterances in session I, were produced more frequently in the Familiar than the Unfamiliar Adult condition($F=6.35, 1/9, p < .04$). A significant Adult x Socio-linguistic Function interaction($F=4.77, 4/36, p < .004$), however, revealed that this difference was significant only in regard to child-utterances coded within Function 5(Informative). In both Adult conditions, Function 5 occurred most often, followed by Function 1(Instrumental), with the remaining 3 Functions occurring equally often and with the least frequency.

The frequencies with which non-imitative utterances were produced in the various Contextual categories were similar to those for the children's imitative productions, with Contextual category 2(Mutual Play) associated with the most utterances produced,

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[1] Functions 6 - 9 were excluded from these analyses, because of their low frequencies of occurrence.

followed by categories 7(Looking at Books), 6(Conversation), 8 (Mildly Frustrating Episode), 1(Solitary Play), 3(Onlooking), 5(Physical Interaction) and 4(Negativistic Behavior)($F=13.241$, $7/63, p < .0001$). A significant Context x Adult interaction ($F=3.48, 3/63, p < .004$) indicated that, except in context 5, the children were more productive with the Familiar than the Unfamiliar adult.

A significant Socio-linguistic Function x Context interaction($F=9.40, 28/252, p < .0001$) indicated that: Function 1 (Instrumental) occurred most often in context 2(Mutual Play), followed by context 6(Conversation); Function 2(Regulatory) occurred most frequently in Context 8(Mildly Frustrating Episode); and Function 5(Informative) occured most often in context 7(Looking at Books), followed by Context's 2(Mutual Play), 6(Conversation) and 8(Mildly Frustrating Episode).

Non-imitative utterances were produced more often in session I than II($F=6.76, 1/9, p < .05$).

A 2(Adult) x 2(Session) x 5(Socio-linguistic Function) analysis of variance indicated that the MLUs of Functions 1, 2 and 3(Interactional) were comparable, and greater than the MLUs of Functions 4(Personal) and 5(Informative), which did not differ from one another($F=5.28, 4/33, p < .003$).

Finally, an additional 2(Adult) x 2(Session) x 5(Socio-linguistic Function) analysis of variance indicated that Spontaneous utterances were produced more frequently in the Familiar than the Unfamiliar Adult condition($F=7.26, 1/9, p < .03$), and were most often associated with Function 5, followed by Functions 1 and 2. Functions 4 and 3 were associated with the fewest Spontaneous utterances.

Multi-sign Utterances

All of the non-imitative, multi-sign utterances produced by each child[1] were grouped according to the case relations they expressed. Whereas Fillmore's(1968) case grammar system served as the basis for this descriptive account, orthodox criteria were not always used in defining the semantic relation between 2 different cases(e.g., "Attributive + Attributive" and "Entity + Entity" do not explicitly express relations between semantic concepts). Definitions of the case concepts included in this analysis are provided in Table 4.

Insert Table 4 about here.

According to Fillmore(1968, p. 24), these "case notions comprise a set of universal, presumably innate, concepts which identify certain types of judgements human beings are capable of making about the events that are going on around them, judgements about such matters as who did it, who it happened to, and what got changed". In essence, this type of approach is focussed upon the manner in which language is used to express relations between events and animate and inanimate(including mental and physical) objects.

Table 5 summarizes the case relations, and concatenations, reflected in the children's multi-sign utterances.

Insert Table 5 about here.

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[1] Grant produced no non-imitative, multi-sign utterances, and so is excluded from consideration here.

Louis(one of the lower-functioning children in the sample) produced only 7 non-imitative, multi-sign utterances, together indicative of only 2 relational(or more correctly, concatenative) types. Ann(one of the higher-functioning children), on the other hand, produced 61 multi-sign utterances. Her utterances were the most varied of the sample in terms of the various types of case relations(12) expressed.

Detailed accounts of these 2 children's multi-sign utterances, along with descriptive combinatorial rules, are given in Tables 6 and 7.

Insert Tables 6 and 7 about here.

It is of interest to compare the corpora of these 2 children, since they represent the 2 extremes of the present sample. For instance, whereas Louis's language was in all cases "concrete" (i.e., referred only to the immediate context and to his own Instrumental desires), Ann's use of sign language was quite varied, both in terms of surface structure and ideational content.

DISCUSSION

Each of the children in the present study demonstrated the ability to employ sign language in the service of a variety of socio-linguistic goals, and to generalize the use of learned vocabulary skills to social situations with an unfamiliar adult. There was, of course, a good deal of variability between children in terms of the frequency with which sign language was produced and

in regard to the novel and combinatorial use of signs. For the most part, it might be concluded that the children's language was marked by a lack of spontaneity and creativity(cf. Bonvillian & Nelson, 1978 and Schaeffer, Kollinzas, Musil & McDowell, 1977 on this commonly cited difficulty with similar populations exposed to SC training).

A good deal of the children's signing was responsive in nature -- produced in response to direct questions(and implicit prompts) by the adults. As discussed by Fay(1969), though, such responsiveness may in part be considered as an optimistic outcome, insofar as these children presented with marked social avoidance behaviors and a virtual absence of language production skills at the start of training. Also encouraging to note, despite the children's relatively infrequent use of signs in spontaneous and combinatorial fashions, were the apparent functions, or motivations, of their imitative utterances. Approximately half of the children's utterances were imitative in nature. Of these imitations, 35% were produced for the apparent purpose of providing a socially acceptable response to the adult's comments (when another, more appropriate or meaningful answer or statement was not available to the child). An additional 58% of the children's imitations seemed consistent with a "practicing" role (or with "functional assimilation", in the Piagetian sense). In this regard, it is interesting to note that other researchers (e.g., Bloom, Hood & Lightbrown, 1974; Whitehurst & Vasta, 1975) have reported that some normal children, too, seem to employ imitation in the service of learning new lexical and grammatical forms and/or strengthening those forms which are already understood

but not yet in the child's productive repertoire.

Of the socio-linguistic functions associated with the children's non-imitative utterances, the Informative[1] was predominant(accounting for 63% of their signing). A good deal of the informative use of signs took place within the contexts of looking at books and simply "conversing" with the adults -- situations in which the adults asked many questions and tended to direct the children's activities. The more assertive(and, perhaps, pragmatic)uses of language by the children concerned the Instrumental and Regulatory functions. The occurrence of these functions was often accompanied by child-initiated activities; they involved the child's approach and interaction with the adult, for the purposes of obtaining desired objects and events, and importantly included attempts to control the situation and the adults' behaviors. Together, these two functions accounted for 28% of the non-imitative utterances for the sample, and would seem to represent a very practical benefit of SC training for such children. In addition, the average MLU values of these functions were larger than that of the Informative, reflecting the children's greater propensity to use signs in a combinatorial fashion when language can be associated with predictable, intentional and desirable consequences.

As expected, the children's non-verbal, conceptual abilities were related to the semantic notions they expressed through the combinatorial use of signs.[2] As exemplified by a comparison of

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[1] It should also be noted that the relative frequency of spontaneous signing within this category seemed indicative of the children's use of sign language to establish and maintain social interaction(i.e., of the Interactional as well as the Informative function.).

[2] The children's scores on the Leiter International Performance Scale correlated positively with the number of different case relations each child expressed($r=.6757, df=9, p<.05$).

Ann's and Louis's multi-sign utterances, the children varied widely in terms of the content and complexity of their signing. Ann and Louis, for instance, had each acquired vocabularies of close to 200 signs. Whereas Ann had made substantial progress in the development of a (case) grammatical system, however, Louis's level of linguistic skill remained quite primitive. On the basis of the data presented, it would appear that the focus of Louis's SC training regimen should be altered -- away from that of vocabulary growth and simple labelling routines, and towards the goal of the more varied and pragmatic use of even a limited vocabulary repertoire.

It is suggested that a case grammar framework can be useful in assessing the autistic child's level of linguistic development. In conjunction with a socio-linguistic orientation, the semantic case notions may prove useful in the design of training procedures for individual children. Rather than choosing vocabulary development as the primary goal of SC training(or as the main index of linguistic progress), it seems that the communicative breadth of the child's language skills should be of primary concern.

The data presented in this report has been discussed mainly in terms of average performance profiles for the sample. Whereas the general patterns observed were consistent with much of the individual data, the children quite obviously varied in their conceptual and expressive abilities. The general flavor and utility of the socio-linguistic and case grammar approaches have been stressed. These models are proposed to be of value in the assessment of individual children, and in the design of training goals and procedures.

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Table 1 . Socio-linguistic Categories[a]

1. Instrumental: language as a means of getting things done

   e.g., I want that; give me the toy

2. Regulatory: language used to control one's own or others' behavior

   e.g., tie my shoes; open the jar, please

3. Interactional: language used to establish or maintain interpersonal contact

   e.g., good morning; oh look!; imitations

4. Personal: language which reflects an awareness of one's individuality

   e.g., I'm hungry; I like that

5. Informative: language used to convey information

   e.g., the car is red; that's a ball

6. Heuristic: language as a means of exploring the environment

   e.g., what is that?; what's that called?

7. Imaginative: language used in the realm of play and fantasy

   e.g., rhyming; word-play

8. Other: uninterpretable or ambiguous utterances

9. Prompt: the adult provides an explicit "language model" for the child to imitate, or explicitly directs the child to produce a sign(s) or word(s)

   e.g., You say, "This is a ball"; Sign, "Help please"

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[a] Categories 1 - 7 are based upon Halliday(1975).

Table 2 . Types of Imitation[a]

1. Interactive: the child imitates a part or all of the adult's question or instruction, in place of a more appropriate or informative response

   e.g., Adult: Can you tell me your name?
   Child: your name

2. Assimilative: the child imitates a part or all of the adult's narrative or statement

   e.g., Adult: Oh look, a picture of a little bird...
   Child: picture bird
   Adult: ...and the bird is flying over the trees...
   Child: fly tree

3. Prompted: the child imitates in response to an explicit direction by the adult, with the adult providing a complete or partial model of the desired response

   e.g., Adult: Sign to me. Sign, "good morning".
   Child: good morning

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[a] A child's utterance was considered to be imitative if it was an exact or approximate repetition of all or part of the adult's model utterance. Additional criteria for imitation were: that the child's repetition occur within 30 seconds of the adult's model, and/or that not more than three child-utterances intervene between the adult's model and the child's imitation. Imitation by the children was coded according to these three types, for session II only.

Table 3 . Number and Mean Length of Imitative and Non-imitative Utterances Produced by Each Child

	Imitative[a]		Non-imitative[b]		Overall[c]	
Child	# Utterances	MLU	# Utterances	MLU	# Utterances	MLU
Ann	82	1.27	164	1.64	246	1.52
Henry	59	1.10	366	1.91	425	1.80
Nick	65	1.49	177	1.26	242	1.32
Grant	55	1.11	108	1.00	163	1.04
Calvin	111	1.31	98	1.61	209	1.45
John	123	1.33	46	1.39	169	1.35
Bob	95	1.08	125	1.04	220	1.06
William	62	1.03	29	1.31	91	1.12
Carl	31	1.13	314	1.35	345	1.33
Louis	141	1.11	93	1.12	234	1.11
Mean	82.4	1.20	152.0	1.36	234.4	1.31

[a] Data on imitation is from session I only.

[b] Non-imitative utterances include only those coded within socio-linguistic categories 1 - 5.

[c] Since imitative utterances from session II are not included in the present data, it should be noted that Overall # of utterances is actually an under-estimation of all utterances produced. Overall MLU, on the other hand, is likely a slight over-estimation for most of the children.

Table 4. Case Concepts[a]

Verb: a verb of action or state

e.g., play toys[b]

Objective: anything representable by a noun whose role in the state or action named depends upon the meaning of the verb

e.g., candy eat

Dative: the animate being affected by the state or action named by the verb

e.g., I want juice

Agentive: the animate, perceived instigator of action

e.g., Mark go walk

Locative: the location or spatial orientation of the state or action named by the verb

e.g., toilet go

Temporal: the point in time corresponding to the state or action named by the verb

e.g., tomorrow drive bowling

Instrumental: the inanimate force or object causally involved in the state or action named by the verb

e.g., chew eat teeth

Factitive: the object or being resulting from the state or action named by the verb

e.g., draw black brown horse bowling

Essive: the name or label explicitly ascribed to a given object or being

e.g., this is a shoe

Genetive: the object or being having inalienable possession of the state or action named by the verb

e.g., mouse ear

Attributive: the feature or quality ascribed to an object or being

e.g., sick Mark home

Entity: the objects or beings named in a simple list or concatenation

e.g., home hammer window

please: a term used frequently in multi-sign utterances by the children in the present sample, and therefore included in the descriptive grammars(see text for further discussion)

e.g., please help cookie

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[a] Based in part upon Fillmore(1968) and adapted from Brown(1973).

[b] Examples given are from the children's productions.

Table 5 . Summary of the Case Relations Expressed in the Children's[a] Non-imitative, Multi-sign Utterances

Cases[b]	Ann	Carl	Henry	Nick	Calvin	Bob	John	William	Louis	# of Children
V + O(+ please)[c]	x	x	x	x	x		x	x	x	8
V + D			x	x	x					3
V + A	x		x							2
V + L		x	x							2
V + T	x	x								2
V + I	x									1
V + D + O		x	x	x	x					4
V + E + O					x		x			2
V + A + O	x									1
V + Att + F	x									1
V + Att + L	x									1
V + T + L		x								1
L + O	x	x								2
D + O					x					1
E + O				x						1
G + O						x				1
L + T		x								1
Att + O	x	x	x	x		x				5
Att + L + O	x	x								2
Ent + Ent	x	x	x	x		x				5
Att + Att	x	x	x							3
V + V			x	x						2
V + please			x		x		x	x		4
O + please						x		x	x	3
# combination types expressed	12	11	10	7	6	4	3	3	2	

[a] Grant produced no non-imitative, multi-sign utterances and so is not listed.

[b] Verb, Objective, Dative, Agentive, Locative, Temporal, Instrumental, Factitive, Essive, Genetive, Attributive, Entity

[c] "Please" was added to the "V + O" construction by William and Louis, and was considered to be an optional element.

Table 6. Louis's Non-imitative, Multi-sign Utterances: Case Relations and Combinatorial Rules

Case Relations	Examples	# Utterances
Objective + please	cookie please	4
V + Objective + please	juice drink please	$\frac{3}{7}$

Combinatorial Rules[a]

1.) O please (V)

[a] In writing the combinatorial rules, the following notational system was used:

X : the case "X" must occur

(X) : the case "X" is an optional element

(X Y) : either the case "X" or "Y", or both, must occur

$\binom{X}{Y}$: the case "X" or "Y", but not both, must occur

Table 7 . Ann's Non-imitative, Multi-sign Utterances: Case Relations and Combinatorial Rules

Case Relations	Examples	# Utterances
V + Objective	eat candy cracker	6
V + Agentive	Mark go walk	11
V + Temporal	tomorrow drive(ride in car?) bowling	1
V + Instrumental	chew eat teeth	1
V + Agentive + Objective	cow eat grass	1
V + Attributive + Factitive	draw black brown horse bowling	1
V + Attributive + Locative	two(candies) out help	1
Locative + Objective	Karen home	9
Attributive + Objective	pants orange	12
Attributive + Locative + Objective	sick Mark home	11
Entity + Entity	cookie cracker	3
Attributive + Attributive	red brown	4
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Combinatorial Rules[a]

1.) V (A O)

2.) V Att (L / F)

3.) V (T / I)

4.) L O (Att)

5.) Att (Att / O)

6.) Ent Ent

[a] See Table for the notational system used.

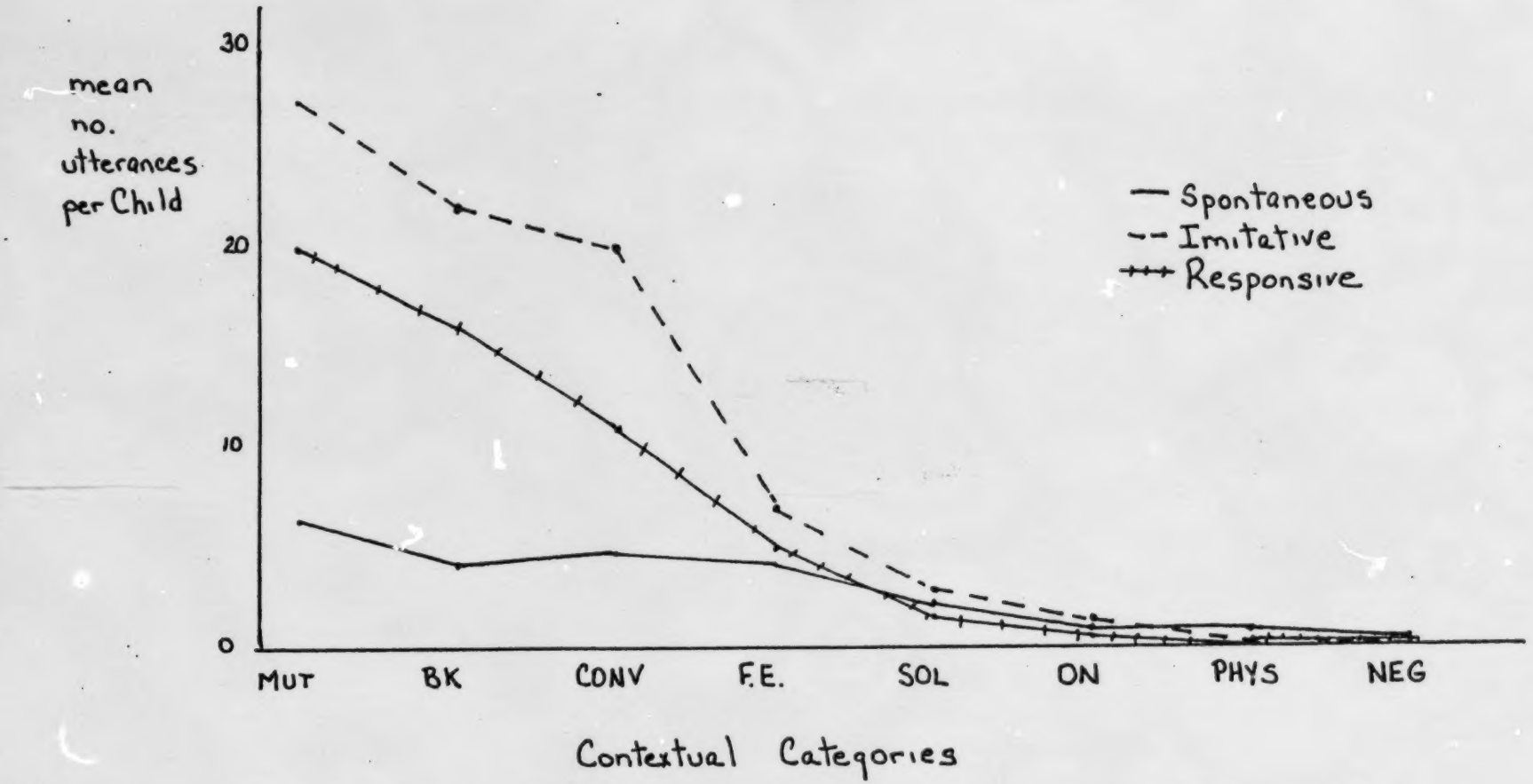

Figure 1 . Mean number of Spontaneous, Imitative and Responsive utterances produced, per child, in session I within each Contextual category.

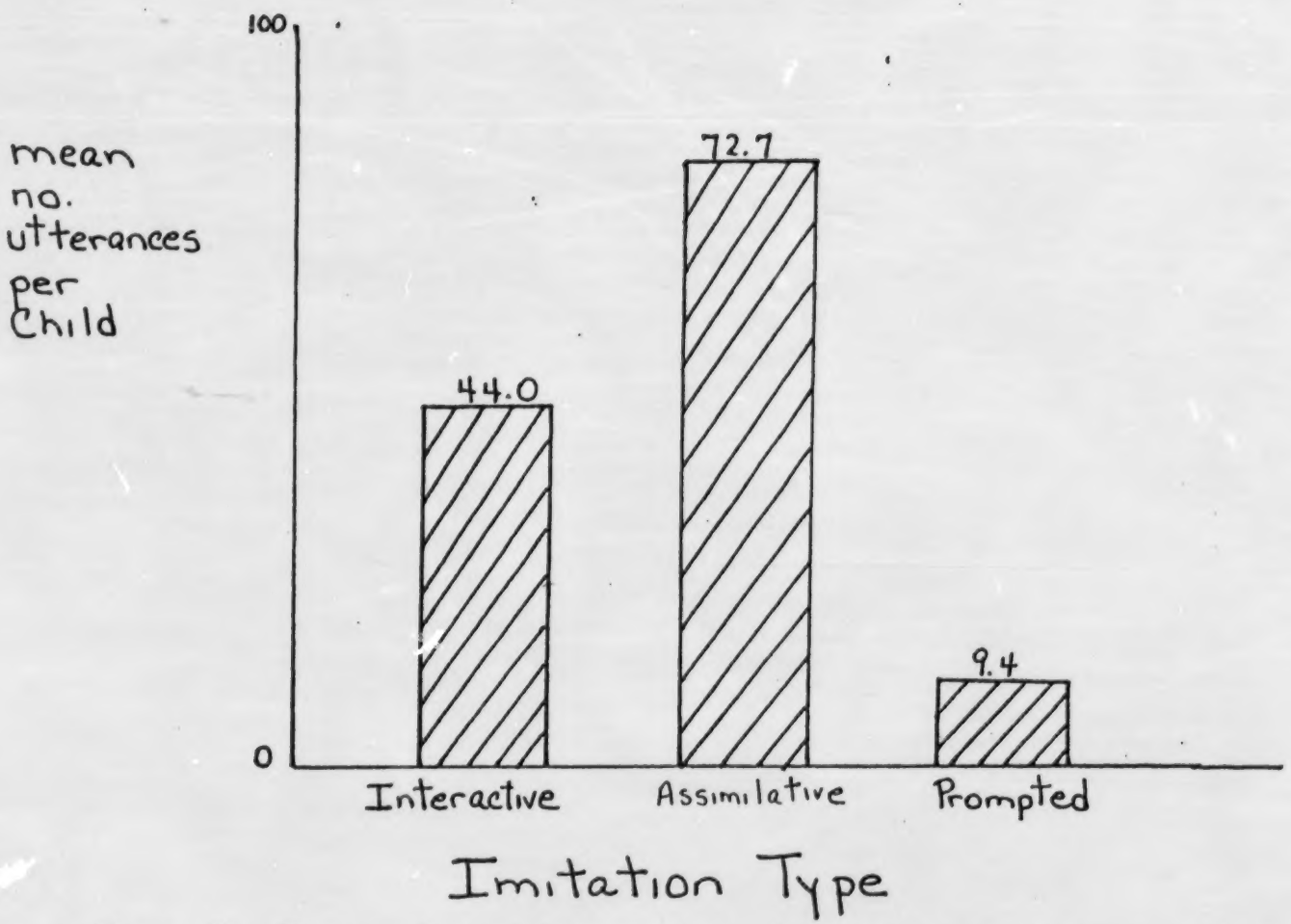

Figure 2 . Mean number of Interactive, Assimilative and Prompted imitations produced per child, in session II.

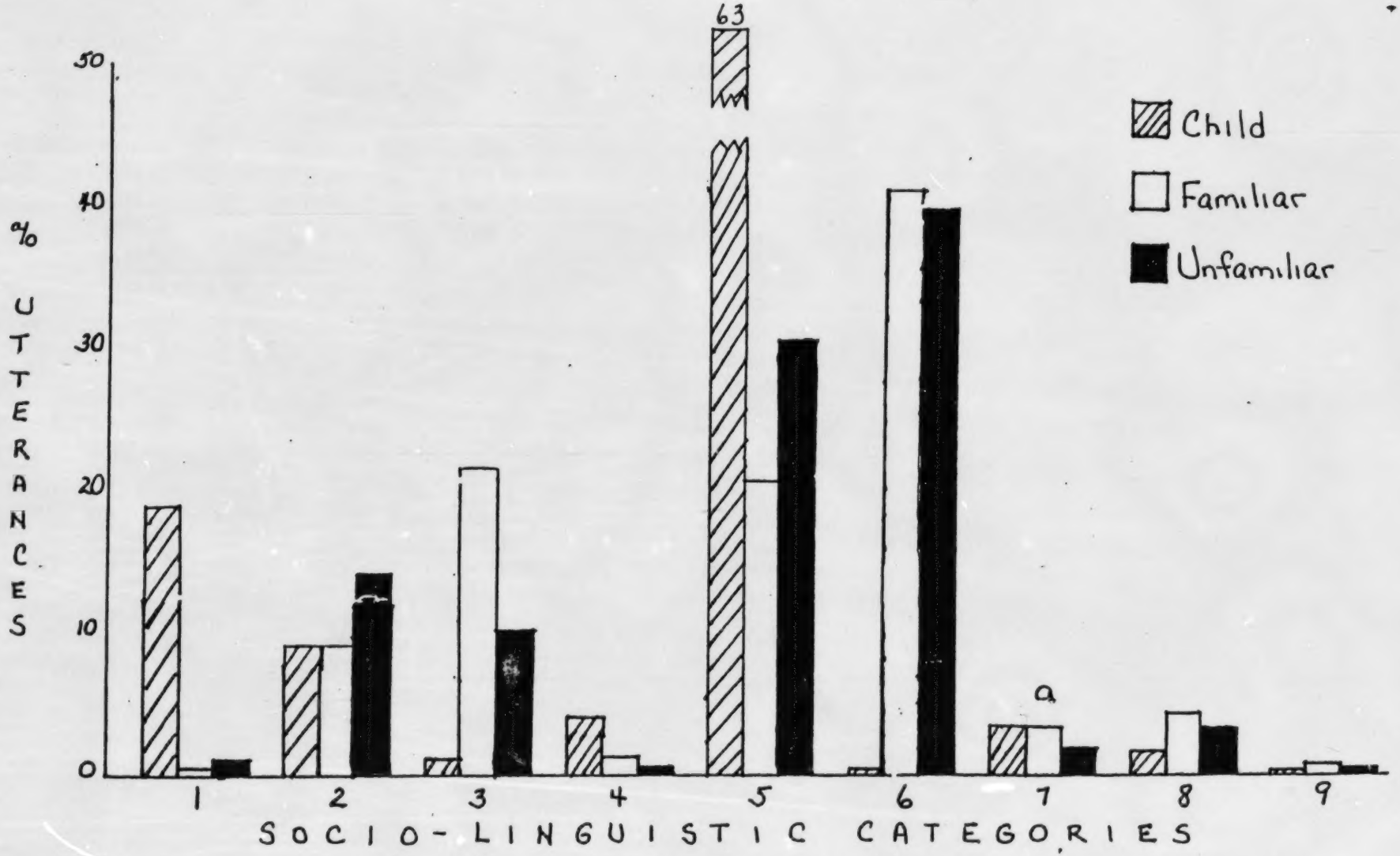

Figure 3 . Mean percent of the children's non-imitative utterances, and of the adults' utterances, across the socio-linguistic categories.

[a] Utterances included in Category 7(the Imaginative function) were simultaneously coded in other functions as well.